

Remarks

Claims Status

Claims 1-3, 8-12, 16, 37 and 87-91 are pending.

Claims 5 and 86 are hereby canceled herein without prejudice.

Claims 87-91 are new and applicant respectfully requests addition and consideration of same.

New Claims 87-91

Applicant respectfully requests consideration of new claims 87-91, which have been added to claim a CVD precursor composition not contemplated by the prior art of record. Specifically, the claimed CVD composition includes at least one metalloamide source reagent compound of a formula:



wherein M is Hf, Y or Ta; N is nitrogen; R¹ and R² are independently selected from the group consisting of H, aryl, perfluoroaryl, C₁-C₈ alkyl, C₁-C₈ perfluoroalkyl, and alkylsilyl; x is from 1 to 5 and equal to the oxidation state of metal M.

Formal Drawings in Accordance with 37 CFR § 1.85

Applicant acknowledges acceptance of the drawings received by the Office on June 19, 2003.

Claim Rejections Under 35 U.S.C. § 102(b)

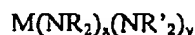
In the August 15, 2003 Office Action, claims 1-3, 5, 11, 12 and 37 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,583,205 to William S. Rees, Jr. (hereinafter referred to as "Rees"). Specifically, the Examiner states,

Regarding claims 1 and 37, Rees discloses a CVD (chemical vapor deposition) precursor composition for forming a thin film dielectric on a substrate, including at least one metalloamide source reagent compound, or a vapor source reagent mixture including a metalloamide source reagent compound, having the formula $M(NR_1R_2)(NR'_1R'_2)_y$ (col. 5, line 20; col. 6, line 45) wherein M is a metal selected from Li, Zn, Y, La, lanthanide and actinide series elements (called the "F-series"), (Abstract; col. 6, lines 27-30; col. 7, Table 1); N is nitrogen; each of R₁, R₂ is R'₁ and R'₂ is the same or different and is independently selected from of [sic] alkyl, alkenyl,

aryl, C₁-C₈ alkyl, C₁-C₈ perfluoroalkyl, alkylsilyl; (col. 3, lines 24-43; col. 5, lines 1-28); and x is from 1 to 5 and y is from 1 to 5 and x+y is the oxidation state of metal M. (See also col. 6, lines 6-56).

Such rejection of the claims is traversed in application to the claims as now amended, and in light of the ensuing remarks.

The present claimed invention is directed to a metalloamide precursor composition for chemical vapor deposition formation of dielectric thin films. The composition includes at least one metalloamide source reagent compound having a formula:



Where M is Y, La, or Ta; N is nitrogen, R and R' are independently selected from H, aryl, perfluoroaryl, C₁-C₈ alkyl, C₁-C₈ perfluoroalkyl, and alkylsilyl; x and y are different amino ligands; x is from 1 to 5; y is from 1 to 5; and x+y is equal to the oxidation state of metal M.

Rees is directed to a metalorganic chemical vapor deposition method for deposition of an F-series metal onto a semiconductor substrate. The F-series metal is ligated to at least one amino ligand having a generic formula -NR₁R₂, where R₁ and R₂ are independently alkyl, alkenyl, aryl or di- or trialkyl-substituted silyl, or together with the nitrogen atom to which they are attached comprise a heterocyclic ring (col. 2, lines 54-67). Rees further teaches that when the F-series metal is bonded to more than one amino group, the metal amide may have a similar generic formula (NR₁R₂-M-NR'₁R'₂), where the R groups are as described above (col. 5, lines 15-28).

Anticipation requires that a prior art reference disclose each and every element of a claim with sufficient clarity to prove its existence in the prior art. Rees fails to teach or suggest Y, La or Ta amide compositions.

On such basis, applicant's present claims, as amended, are not anticipated by Rees as Rees fails to sufficiently limit or delineate a metalloamide composition having two different amino groups bound to Y, La or Ta.

Applicant's present independent claims 1 and 37 and claims 2-3, 11, and 12, which depend therefrom, exclude the metalloamide species taught by Rees and are therefore patentably distinct under 35 U.S.C. § 102(b). Accordingly, applicant respectfully requests the Examiner withdraw the rejection under 35 U.S.C. § 102(b) of claims 1-3, 11, 12, and 37.

Claim Rejections Under 35 U.S.C. § 103(a)

In the August 15, 2003 Office Action, Examiner Kielin set forth the following claim rejections under 35 U.S.C. § 103(a):

Claims 8-10 and 16 as being unpatentable over Rees in view of U.S. Patent No. 6,159,855 issued to Brian A. Vaartstra, (hereinafter referred to as "Vaartstra"); and

Claim 86 as being unpatentable over the article **Bradley and Thomas**, "Metallo-organic compounds containing metal-nitrogen bonds. Part I. Some Dialkylamino-derivatives of titanium and zirconium" Journal of the Chemical Society, 1960, pp. 3857-3861 (hereinafter referred to as "Bradley") in view of either of Rees and Vaartstra.

Such rejections of the claims are traversed in application to the claims as now amended, and in light of the ensuing remarks.

The cancellation made hereinabove of claim 86, renders the present obviousness rejection based on Bradley and Thomas, in view of either Rees and/or Vaartstra moot. Accordingly applicant respectfully requests withdrawal of the rejection.

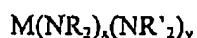
Regarding claims 8-10, Examiner Kielin states,

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use the solvents of Vaartstra as the solvents in the Rees CVD precursor composition, because Vaartstra teaches that metalloamides are soluble in such solvents for the purpose of CVD.

Regarding claim 16, Examiner Kielin states,

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use multiple metalloamides in a CVD precursor of Rees to achieve a deposited layer having both metals, as taught to be beneficial in Vaartstra.

Applicant's claims 8-10 and 16, as amended, are directed to a metalloamide precursor composition for chemical vapor deposition formation of dielectric thin films. The precursor composition includes a solvent medium and at least one metalloamide source reagent compound having a formula:



where M is Y, La, or Ta; N is nitrogen; R and R' are independently selected from H, aryl, perfluoroaryl, C₁-C₈ alkyl, C₁-C₈ perfluoroalkyl, and alkylsilyl; x and y are different amino ligands; x is from 1 to 5; y is from 1 to 5; and x+y is equal to the oxidation state of metal M. The solvent medium is selected from ethers, glymes, tetraglymes, amines, polyamines, alcohols, glycols, aliphatic hydrocarbon solvents, aromatic hydrocarbon solvents, cyclic ethers and combinations of two or more of the foregoing.

Rees teaches a metalorganic chemical vapor deposition method for deposition of an F-series metal onto a semiconductor substrate. The F-series metal is ligated to at least one amide ligand having a generic formula -NR₁R₂, where R₁ and R₂ are independently alkyl, alkenyl, aryl or di- or trialkyl-substituted silyl, or together with the nitrogen atom to which they are attached comprise a heterocyclic ring (col. 2, lines 54-67). Rees further teaches that when the f-series metal is bonded to more than one amide ligand, the metal amide may have a similar generic formula (NR₁R₂-M-NR'₁R'₂), where the R groups are as described above (col. 5, lines 15-28).

Rees fails to teach or suggest Y, La, or Ta metalloamide compositions comprising **different amino ligands** (emphasis added) bonded to a metal center M. Moreover, Rees is silent as to the use of solvents with the metalloamide compositions.

Vaartstra is directed to metalloamide compounds useful for chemical vapor deposition of multi-metallic films, and cites preferred metals of the invention as Groups IA, IIA, IIIA, IVA and the transition metals (column 4, lines 10-31). Vaartstra defines the transition metals as encompassing elements of atomic number 21 through 30 (scandium through zinc), 39 through 48 (yttrium through cadmium), 57 through 79 (lanthanum through gold) and all elements from atomic number 89 (actinium) on. In total, Vaartstra discloses 89 metals for use in metalloamide compounds.

Vaartstra's metalloamide compounds include a metal from the list above and an amino group, wherein each amino group comprises at least two N-R bonds where R is disclosed as H or carbon. (See column 4, lines 54-57).

Vaartstra sets forth at column 6, lines 6-56, 46 bi-metalloamide compositions comprising amino groups bonded to a metal center where the particular amino group does not vary within a metal center.

Vaartstra fails to teach or suggest **Y, La, or Ta** metalloamide compositions comprising **different amino ligands** (emphasis added).

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art, (MPEP 2143.03). And as neither Rees nor Vaartstra teach or suggest to make **Y, La, or Ta** metalloamide compositions comprising **different amino ligands** (emphasis added), the criteria for a reasonable expectation of success has not been met.

Based on the foregoing, claims 8-10 and 16 are patentably distinguished from the prior art. Accordingly, applicant respectfully requests reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) of claims 8-10 and 16 as being obvious over the combination of Rees in view Vaartstra.

Petition Under 37 CFR 1.136 for Three Month Extension of Time

Petition hereby is made under the provisions of 37 CFR 1.136 for a three month extension of the term for response to the August 15, 2003 Office Action, extending the term for response to February 15, 2004.

Fees Due and Payable

In connection with applicant's Petition Under 37 CFR 1.136 for Three Month Extension of Time, a fee of \$950 as specified in 37 CFR 1.17(a)(3), is hereby authorized to be deducted from the Deposit Account No. 50-0860 in the name of applicant, Advanced Technology Materials, Inc., 7 Commerce Drive, Danbury, CT 06810.

There are no fees due in connection with amendments to claims made herein, as applicant has not exceeded the number of original claims, including independent, for which payment was originally made (85 claims; 9 independent).

Should the Office determine however, that a fee or charge is payable in connection with the entry of this Amendment, or furtherance of the present application, the Office is hereby authorized to

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charge any such fee to Deposit Account No. 50-0860, in the name of Advanced Technology Materials, Inc..

CONCLUSION

Applicants have now made an earnest attempt to place this case in condition for allowance. For the foregoing reasons and for other reasons clearly apparent, applicants respectfully request reexamination and reconsideration of this application and full allowance of claims 1-3, 8-12, 16, 37 and 87-91.

In the event that any issues remain outstanding, incident to the formal allowance of the application, the Examiner is requested to contact the undersigned agent at (203) 794-1100 ext. 4184 to discuss their resolution, in order that this application may be passed to issue at an early date.

Respectfully submitted.


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